

REMARKS

Claims 1 - 12 are now pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 112

Claims 1 - 8 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point and distinctly claim the subject matter which Applicants regard as the invention. This rejection is respectfully traversed.

Independent claims 1, 2, and 5 call for an imaging focal point of a sensor camera to be shifted away from a surface of a workpiece at a distance greater than a focal length of the sensor camera. The Examiner alleges that this limitation is indefinite because if the image is out of focus or not well defined, it is unclear how the system evaluates the image. Notwithstanding, Applicants respectfully assert that such limitation is not indefinite.

More specifically, this limitation is explained in paragraphs [0032] to [0035] of the specification and, for example, Figures 4 and 5. As described in paragraphs [0032] to [0035] and shown in Figures 4 and 5, the present invention is directed to a method for detecting light passing through a through hole. The detection of light determines whether a through hole is blocked with any foreign matter. During this detection, if the focal point of the camera is concurred with a surface of the workpiece (i.e., in a focused condition), only a small area of light passing through holes can be detected.

In contrast, when the imaging focal point of the camera is shifted away at a distance greater than a focal length of the camera (i.e., in an unfocused condition), as claimed, the area (number of through holes) for detecting light may be expanded. In this manner, a greater number of through holes may be inspected. As such, Applicants respectfully assert that the independent claims and the claimed limitation of an imaging focal point of the sensor camera being shifted away from a surface of the workpiece at a distance greater than a focal length of the sensor camera is not indefinite.

Accordingly, reconsideration and withdrawal of this rejection is respectfully requested.

REJECTION UNDER 35 U.S.C. § 103

Claims 1, 3 - 4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Broadbent, Jr. et al. (U.S. Pat. No. 4,555,798) in view of Stein et al. (U.S. Pat. No. 6,104,427). This rejection is respectfully traversed.

The Examiner alleges that Broadbent substantially teaches the claimed invention, but fails to teach an imaging focal point sensor camera being shifted away from a surface of the workpiece at a distance greater than a focal length of the sensor camera. Notwithstanding, the Examiner alleges that such a limitation is obvious because Stein teaches scanning and inspecting articles wherein the camera optics are varied depending on the distance to the surface of the object. That is, Stein allegedly teaches the claimed limitation of an imaging focal point of the sensor camera being shifted away from a surface of the workpiece at a distance greater than a focal length of

the sensor camera. Applicants, however, respectfully assert that Stein contains no such teaching.

More specifically, Stein teaches at column 3, lines 45 – 53 that a “line sensor in the line camera is shifted relative to the camera optics for the purposes of automatic focusing. In practice, the camera optics or an imaging lens are held in position and the distance of the line sensor and the line camera from the lens or optics is varied depending on the distance to the surface of the object. A shift of the order of 1 – 2 mm is sufficient to even out the image focus for height differences of 800 mm with an object distance of at least 3 m.” (emphasis added) By this disclosure, Stein teaches exactly what the claimed invention is intending to avoid. That is, Stein is teaching a method wherein a line sensor and a line camera are shifted for the purposes of focusing the image to be taken (i.e., concurring the imaging focal point and focal length).

In contrast, as discussed under the rejection under 35 USC § 112, the claimed invention is directed to a system wherein an imaging focal point of a sensor camera is shifted away from a surface of the workpiece at a distance greater than a focal length of the sensor camera. This results in an unfocused condition. Since Stein teaches a system wherein an in-focused method is taught, the claimed invention would not have been obvious because the imaging focal point of the sensor camera is not shifted away from a surface of the workpiece at a distance greater than a focal length of the sensor camera, as claimed.

Moreover, Stein teaches at column 8, lines 35 – 41 that “[b]ecause of the very large distance between the camera lens and the package surface 9 compared to the relatively small distance between line sensor 6 and camera lens 5, a height change of

the line sensor 6 of the order of 1-2 millimeters is sufficient to clearly image all package surfaces 9 with surface heights between the tallest package P1 and the shortest package P2.” Again, by this disclosure, Stein teaches a system wherein all images are taken in a focused condition. In contrast, the claimed invention is directed to a method wherein images are taken in an out of focus condition. Since both Stein and Broadbent fail to teach an examination wherein an imaging focal of the sensor camera is shifted away from a surface of the workpiece at a distance greater than a focal length of the sensor camera, the claimed invention would not have been obvious.

Applicants also respectfully assert that neither Broadbent nor Stein contain any disclosure that would teach, suggest, or provide motivation to one skilled in the art to shift the sensor camera away from a surface of the workpiece such that a distance of the camera for the workpiece is at a distance greater than the focal length. This is because both Broadbent and Stein are completely silent with respect to focal lengths. Moreover, Stein merely teaches that that a sensor camera should be in a focused condition. Since an imaging focal point that is shifted away from a workpiece at a distance greater than a focal length of a camera is neither taught nor suggested by the prior art, the claimed invention would not have been obvious.

Claims 2, 5 – 8 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Broadbent, Jr. et al. (U.S. Pat. No. 4,555,798) in view of Stein et al. (U.S. Pat. No. 6,104,427) and in further view of Onishi et al. (U.S. Pat. No. 5,347,591). This rejection is respectfully traversed.

As stated above, neither Broadbent nor Stein teach or suggest an imaging focal point of a sensor camera being shifted away from a surface of the workpiece at a

distance greater than a focal length of the sensor camera. Onishi also fails to teach or suggest such a limitation. The claimed invention, therefore, would not have been obvious in view of Broadbent, Stein, and Onishi. Accordingly, reconsideration and withdrawal of this rejection is respectfully requested.

NEW CLAIMS

New claims 9-12 have been added. These claims are fully supported by the specification and drawings as originally filed. Particularly, these claims are supported at paragraph [0032] and Figure 1. None of the cited references teach, suggest, or provide motivation to utilize a through hole examination method or apparatus that conducts imaging in an out-of-focus condition. Since this element of the claims is neither taught nor suggested, claims 9-12 should be in condition for allowance.


Favorable consideration of these new claims is respectfully requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

Dated: April 27, 2005

By: 
G. Gregory Schivley, Reg. No. 27,382
Bryant E. Wade, Reg. No. 40,344

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

GGs/BEW/JAH